

Effects of Microplastics on Groundwater Quality

Fadime Kara Murdoch (karamurdoch@battelle.org) and Katarzyna Hanna Kucharzyk
(Battelle Memorial Institute, Columbus, OH, USA)
Yanchen Sun and Frank E. Löffler (University of Tennessee, Knoxville, TN, USA)

Background/Objectives. Bioremediation plays a major role in the transformation and detoxification of chlorinated solvents and only some strains of *Dehalococcoides mccartyi* (*Dhc*) are able to detoxify chlorinated ethenes to environmentally benign ethene. The persistence of microplastics (MPs) and nanoplastics (NPs) in environmental systems has started to raise concerns. Inhibitory effects of nano/microplastics on biological processes like sludge digestion, nitrification/denitrification, hydrogen generation and methanogenesis have been recently documented, yet little is known on the impacts of MPs and NPs on bioremediation processes. Our study is focused on the potential inhibitory effects of different types of nano/microplastics on reductive dechlorination of chlorinated solvents.

Approach/Activities. The reductive dechlorination activity of mixed dechlorinating-culture SDC-9 in the presence of PS (10 μm) and nylon 6 (15-20 μm) microplastics has been evaluated. The dechlorination of trichloroethene (TCE) has been monitored using gas chromatography with flame ionization detector (GC/FID). *Dehalococcoides spp.* cell abundance has been determined by quantitative PCR. Targeted proteomics will be used to quantify process-specific reductive dehalogenases.

Results/Lessons Learned. The effects of MPs on reductive dechlorination rates, on microbial abundance and community structure within the SDC-9 consortium will be analyzed. Inhibitory effects of microplastics on bioremediation processes will be judged by decreased rates of transformation of chlorinated ethenes to intermediates and end products. The results will build a foundation of knowledge that will inform decision-making processes for contaminated site remediation strategies. Depending on the results of this study, we envision a significant contribution to decision strategies for RPMs and site managers.